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Comparative Evaluation Of Platelet Indices And Blood Glucose Level Correlations In Gestational Diabetes Mellitus" In Pregnancy - A Retrospective Case-Control Study

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Abstract

Background - Gestational diabetes mellitus (GDM) is one of the most common medical conditions complicating pregnancy. It is characterized by glucose intolerance that emerges during pregnancy, typically due to increased insulin resistance. Elevated blood glucose levels can alter platelet morphology and function, potentially contributing to vascular complications.

Objective - This study aims to compare and evaluate platelet indices in healthy pregnant women and patients with gestational diabetes mellitus. The association between blood glucose levels and mean platelet volume is also examined in this study.

Methods - A retrospective case-control study was conducted using medical data from 100 pregnant women (50 with GDM and 50 healthy controls) between January and December 2021. Inclusion criteria were based on glucose tolerance tests conducted between 24–28 weeks of gestation. Platelet parameters and HbA1c were assessed using standard hematological analyzers. Statistical analysis was performed using Student's t-test, with a significance level set at $p < 0.05$.

Results - The study found significantly higher MPV ($p < 0.0001$) and HbA1c ($p < 0.0001$) values in the GDM group compared to controls. Platelet count and PDW did not show significant differences between the groups. These findings suggest a possible association between hyperglycemia and increased platelet activation in GDM.

Conclusion - MPV, a marker of platelet activation, and HbA1c is elevated in gestational diabetes and may serve as a useful, easily accessible indicator for identifying high-risk pregnancies. Further research is warranted to validate its prognostic value and potential role in preventing diabetes-related vascular complications in pregnancy.

Keywords - Blood Glucose**,** Blood Platelets**,** Diabetes, Gestational Diabetes, Glycosylated Hemoglobin, HbA1c, Mean Platelet Volume, Pregnancy, Pregnancy Complications.

Introduction

Diabetes mellitus (DM) is a metabolic disorder that strikes around 171 million individuals globally today, is expected to affect 366 million by 2030. By 2030, India will have the highest proportion of diabetics in the world. In India, 40.9 million people were diagnosed with diabetes in 2014, with a projection of 80 million by 2030. [1]

Gestational diabetes mellitus (GDM) is one of the most common chronic conditions in pregnancy, and according to one study, it is the most common medical condition in pregnancy.[2] GDM is more common in pregnant women whose pancreatic activity is insufficient to overcome pregnancy-induced insulin resistance.[3]

On the important parameter associated with Dm is Platelet reactivity, which is higher in patients suffering the condition. Through direct actions and by increasing glycation of platelet proteins, hyperglycaemia contributes to increased platelet reactivity. Platelet reactivity is increased by both insulin resistance and insulin insufficiency. Insulin prevents platelets from becoming activated. As a result, a relative or absolute insulin deficit would increase platelet reactivity. [4] GDM is expected to affect 13.2% of the world's population.[5] According to the most current Iranian survey, 81.8 % of people have GDM.[6] In addition, the relapse rate for GDM is said to be 30–69%.[7] According to International Diabetes Federation guidelines, a glucose tolerance test(GTT) carried out at 24 to 28 weeks of pregnancy which confirms a fasting blood sugar of more than 92, a level of glucose up to 180 mg/dL 1 hour after taking 75 g of glucose, and or a glucose level more than 153 mg/dL 2 hours after taking 75 g of glucose.[8] Weeks to months before a clinical diagnosis of GDM, the patho-physiological process of diabetes begins, and components related with the disease can be found in the bloodstream. [9]

The purpose of this study was to compare and evaluate platelet indices in healthy pregnant women and patients with gestational diabetes mellitus. The association between blood glucose levels and mean platelet volume is also examined in this study.

Material and Methods

A retrospective case control study was conducted in the department of Obstetrics and a tertiary care centre from the medical data book of 100 pregnant (50 cases of GDM, 50 are control) between Jan 2021 to December 2021. In order

to collect laboratory data, patients' records were reviewed.

The study included patients who had a plasma glucose threshold equal to or more than 140 mg/dl one hour after glucose load ingestion in routine condition, as recommended by the American Diabetes Association. Women with medical conditions like high blood pressure, collagen tissue disease, systemic diseases of heart, kidney and liver, bad obstetric history will be excluded from the study.

Between 24 and 28 weeks of pregnancy, the patients were evaluated using a 50-gram(g), 1- hour (h) glucose tolerance test (GTT). Following the 50-g oral glucose intake, which was delivered between 24-28 gestational weeks, a 100 gram, 3 hours oral GTT was performed once the plasma glucose level has reached 140mg/dl.Patients with high results on both tests are suspected of having GD. At the time of diagnosis, the patients' body mass index was measured. All participants in their last trimester were given a fasting peripheral venous blood sample (32-36 weeks) to measure HbA1c.

Blood samples was analysed within half an hour of collection to avoid platelet swelling caused by ethylene diamine tetra acetate (EDTA). Complete blood count (CBC) parameters were measured using an automatic blood counter. For statistical analysis, the student's t test was performed (p=0.005 is considered significant).

Results

The mean age of participants in both groups is similar, with no statistically significant difference ($P > 0.05$). This suggests that age is well matched between groups and unlikely to be a confounding factor. When the MPV and HbA1c of the two groups were compared, it was showed that the MPV ($p<0.001$,S) and HbA1c ($p<0.001$,S) were found to be more significant in the Gestational Diabetic group. (Table 1) (TLC-Total leucocyte count, BMI-Body mass index, HbA1c-glycosylatedhaemoglobin, MPV- Mean platelet volume, PDW- Platelet distribution width). These differences suggest that the case group may have alterations in glucose metabolism and platelet morphology/activation. Other parameters such as age, BMI, TLC, platelet count, and PDW did not show statistically significant differences, indicating these factors are likely not contributing to group differences.

Table1 – Comparison of groups for various values between case and control group			
	Cases	Control	P value
Age	29.6±6.4	27.8±6.7	0.197
BMI	23.7±2.8	23.1±2.7	0.27
TLC	10.1±2.2	9.8±2.2	0.497
HbA1c	6.2±1	4.9±0.7	<0.0001*
Haematocrit	34.7±3.1	33.5±2.6	0.038
Platelet count	228 ± 78.3	212.07±55.07	0.242
MPV	11.8±1.9	8.2±1.5	<0.0001*
PDW	13.1±1.8	12.7±0.92	0.164

Discussion

Diabetes has been linked to changes in platelet morphology and function. [10,11] Diabetes patients have higher platelet activation than no diabetic subjects.[10–12] Increased thromboxane synthesis and/or decreased prostacyclin production were linked to platelet hyperactivity. Mean Platelet Volume is an activation and function marker for platelets.[13] Platelets that are larger are more reactive and agreeable. They have denser granules, synthesize more thromboxane A2, and secrete more serotonin and b-thromboglobulin. This shows a relationship between platelet function and diabetes-related micro-and macro- vascular complications.[10-13]

Platelet hyperactivity in diabetes may play a role in the severe and profound vasculopathies associated with the disease.[10,14] Platelet aggregation has been shown to be increased in diabetes, this could contribute to the onset of vascular problems.[15–17] Platelets react to active leukocytes and endothelial cells by releasing adhesion molecules, which is associate with inflammation and thrombosis.[16] Platelets from newly diagnosed Type 1 diabetes mellitus were found to be activated regardless of metabolic control.[17]

The MPV is used to quantify platelet volume, which is a measure of platelet activation and function.[12] Mean

Platelet Volume can be used as a blood glucose indicator.[12,13,18] Higher MPV values were observed in our study. These MPV values, on the other hand, decreased significantly after blood glucose levels were reduced.[12]

When diabetes individuals were compared to the controls, MPV values were found to be higher. A high MPV has been found in patients with impaired fasting glucose, which is thought to indicate prediabetes.[18] Mean platelet volume can be a good predictor of blood glucose levels.[13,18] According to some studies, diabetic patients' megakaryocyte stem cells have increased aggregation and multiplication functions.[10]

HbA1c values were observed to be higher in diabetes patients in our study. This was a foregone conclusion. The discovery of a raised Mean Platelet Volume insinuates that, it could be helpful as a screening aid for follow up. Further prospective, randomised, controlled studies are needed to confirm its potential. Between the two groups, there was no significant difference in platelet count or platelet distribution width values.

During pregnancy, diabetes is linked to substantial potential systemic and metabolic complications. During antenatal checks, diabetic pregnant women must be closely monitored. To avoid complications of diabetes diseases related with hyperglycemia, which has a severe impact on all maternal systems as well as foetal homeostasis, close monitoring is required. Further research may reveal that pregnant women with poor diabetes management had higher MPV values. As more research into platelet functions in diabetic pregnant women is conducted, we are confident that prenatal and postnatal observation and treatment will improve, resulting in a reduction in fetomaternal problems.

Given the limited number of study participants in the current research still finding points out towards important findings, therefore more research can be done with a larger group population considering the fact that platelet properties and functions could help lower the death and illness rates linked to diabetes during pregnancy, as a higher MPV might suggest increased platelet activation.

Conclusion

The results of this study show that calculating the MPV and other platelet-related parameters is a simple process that can be carried out in the majority of hospital labs. Pregnant diabetic women who are susceptible to vascular issues

may be identified with the use of these parameters. The importance of these parameters in the haemostatic system during pregnancy with diabetes and their clinical implications in terms of thrombosis risk require more investigation.

References

1. Alberti KGMM, Zimmet PZ, World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications: report of a WHO consultation. Part 1. Diagnosis and classification of diabetes mellitus. Geneva. Diabet Med.2015; 15:5.

2. Cunningham, F. Gary, Leveno, Kenneth J, Dashe, Jodi S, Hoffman, Barbara L, Spong, Catherine Y. Casey, Brian M. 1188265131, Williams Obstetrics, 26e, 2022, McGraw Hill Hill Education, New York, NY, 9781260462739, accessmedicine.mhmedical.com/content.aspx?aid=1188265131, 2025/06/07 Cunningham FG. Williams obstetrics. New York (NY): McGraw-;2018.

3. Durnwald C. Diabetes mellitus in pregnancy : screening and diagnosis. Waltham(MA): Up To Date ; 2018.

4. Keating FK, Sobel BE, Schneider DJ. Effects of increased concentrations of glucose on platelet reactivity in healthy subjects and in patients with and without diabetes. Am J Cardiol.2003; 92:1362–1365.

5. Melchior H, Kurch-Bek D, Mund M. The prevalence of gestational diabetes: a population-based analysis of a nationwide screening program. Dtsch Arztebl Int 2017;114:412-8.

6. Rahimi M, Karami Moghadam F. The prevalence of gestational diabetes mellitus and its related risk factors using one-step method in Kermanshah, 2016. Iran J Obstet Gynecol Infertil 2017;20:1-4.

7. Ramezani S, Ahmadi M, Saqhafi H, Alipoor M. Association of pregnancy-associated plasma protein a (PAPP-A) and gestational diabetes. Iran J Obstet Gynecol Infertil 2017;20:61-9.

8. International Diabetes Federation; Madras Diabetes Research Foundation.Management of gestational diabetes in the community. Training manual for community health workers [Internet]. Brussels: International Diabetes Federation.

9. Beneventi F, Simonetta M, Lovati E, Albonico G, Tinelli C, Locatelli E, et al. First trimester pregnancy-associated plasma protein-A in pregnancies complicated by subsequent gestational diabetes. Prenat Diagn 2011;31:523-8.

10. Erikçi AA, Muhçu M, Dündar O, Oztürk A. Could mean platelet volume be a predictive marker for gestational diabetes mellitus? Hematology 2008; 13: 46-8.

11. Dundar O, Yoruk P, Tutuncu L, Erikci AA, Muhcu M, Ergur AR, et al. Longitudinal study of platelet size changes in gestation and predictive power of elevated MPV in development of pre-eclampsia. Prenat Diagn 2008; 28: 1052-6.

12. Bozkurt N, Yilmaz E, Biri A, Taner Z, Himmetoğlu O. The mean platelet volume in gestational diabetes. J Thromb Thrombolysis 2006; 22: 51-4.

13. Hekimsoy Z, Payzin B, Ornek T, Kandoğan G. Mean platelet volume in Type 2 diabetic patients. J Diabetes Complications 2004; 18: 173-6.

14. Mazzanti L, Nanetti L, Vignini A, Rabini RA, Grechi G, Cester N, et al. Gestational diabetes affects platelet behaviour through modified oxidative radical metabolism. Diabet Med 2004; 21: 68-72.

15. Farhan S, Winzer C, Tura A, Quehenberger P, Bieglmaier C, Wagner OF, et al. Fibrinolytic dysfunction in insulin-resistant women with previous gestational diabetes. Eur J Clin Invest 2006; 36: 345-52.

16. Strauss T, Maayan-Metzger A, Simchen MJ, Morag I, Shenkmean B, Kuint J, et al. Impaired platelet function in neonates born to mothers with diabetes or hypertension during pregnancy. Klin Padiatr 2010; 222: 154-7.

17. Vignini A, Moroni C, Nanetti L, Raffaelli F, Cester A, Gabrielli O, et al. Alterations of platelet biochemical and functional properties in newly diagnosed type 1 diabetes: a role in cardiovascular risk? Diabetes Metab Res Rev 2011; 27: 277-85.

18. Coban E, Bostan F, Ozdogan M. The mean platelet volume in subjects with impaired fasting glucose. Platelets 2006; 17: 67-9. Erratum in: Platelets 2006; 17: 350.